ABSTRACT

Airport concrete pavement for aprons, taxiways, hard standings, runway ends for distance of 1,000 ft., and hangar floors as critical areas and concrete pavement for runways (central portion) and some high-speed exit taxiways as noncritical areas of airport are designed with the preset strength safety levels corresponding to strength safety indexes β equal at least to about 3 and 2.5, respectively. Thickness of these pavements is less by 8-10% and 5-10% for critical and noncritical areas of airport, respectively, than that provided by thickness design according to Portland Cement Association Engineering Bulletin (Design of Concrete Airport Pavement, Portland Cement Association, EB 050P). It is achieved due to more complete utilization of flexural strength of concrete than that provided by the current Portland Cement Association design practice. More complete utilization of flexural strength of concrete considered as a random value means the use of values of modulus of rupture exceeding the mean value of flexural strength for thickness design of pavement. Mix design of concrete of each claimed pavement is determined by the value of modulus of rupture (MR) required by the thickness design of this pavement according to said Portland Cement Association Engineering Bulletin. More complete utilization of flexural strength of concrete is based on the statistical investigation of flexural strength of concrete in connection with the compressive strength of this concrete. This investigation was carried out by the processing data of American test results of concrete strength.

According to the invention, fatigue analysis of pavement should be carried out according to the most detailed version of the current Portland Cement Association design procedure or with the use of other methods of fatigue analysis according to the requirements of the customer with more complete utilization of flexural strength of concrete by consecutive use of three values of 90-day modulus of rupture (MR) with the difference of 50 psi. These three values of 90-day modulus of rupture are considered as corresponding to one value of 28-day specified compressive strength of this concrete f_c'. The least of these three is the value of modulus of rupture (MR) required by thickness design of

pavement according to said Portland Cement Association Engineering Bulletin. Any of these three values of modulus of rupture of concrete (MR) can be used for fatigue analysis of pavement, if strength safety of pavement designed with the use of this value of specified flexural strength corresponds at least to strength safety level required according to the invention. More exact estimation of fatigue strength of pavement provides reduction of thickness of pavement.

Moreover, revaluation of strength safety and fatigue strength of existing airport pavements for increasing of allowable aircraft loads is possible due to more complete utilization of flexural strength of concrete than that provided by the current Portland Cement Association design practice of utilization of this strength.

The essence of present invention is in the more complete utilization of flexural strength of concrete than that provided by the current design practice. It is applied to the thickness design of airport critical and noncritical areas pavement with fatigue analysis according to said Portland Cement Association Engineering Bulletin, and can be applied to the thickness design of this pavement with other methods of fatigue analysis.

Furthermore, consideration of statistical connections between flexural and compressive concrete strength allows to choose value of 90-days modulus of rupture (MR) in connection with the corresponding value of 28-days specified compressive strength of this concrete f_c'. It allows to provide design concrete composition for claimed pavement by means of corresponding value of specified compressive strength of this concrete f_c'.